



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL VEHICLE AND FUEL EMISSIONS LABORATORY
2565 PLYMOUTH ROAD
ANN ARBOR, MICHIGAN 48105-2498

OFFICE OF
AIR AND RADIATION

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(ICI/LDV/LDT/)

Dear Manufacturer:

SUBJECT: Request for Comments on Potential Evaporative Regulation Changes; Evaporative Guidance for Certification and In-use Testing.

Over the past few years, representatives of the EPA, the California Air Resources Board (ARB) and the automobile industry have held a series of meetings concerning the certification and in-use test procedures for evaporative emissions. At a June 14, 2001 meeting with these stakeholders, a number of possible modifications were suggested. The purpose of this letter is to provide manufacturers with several of the key modifications to the evaporative and refueling test procedures, which are intended to reduce the evaporative testing burden while maintaining the same enforcement capability as the current test procedures.

Some of these will require EPA regulation changes and some can be implemented under current EPA regulations with prior EPA approval (on a case-by-case basis). Enclosure I contains several evaporative test procedure changes which EPA may consider making via a rulemaking. Manufacturers should not implement these changes until after EPA regulation changes become effective. Although at this time EPA has not officially decided to go forward with a rulemaking, manufacturers may send any initial comments about these potential regulation changes to Dave Good at EPA with a copy to Ms. Lori Berard, ARB. Enclosure II contains guidance and clarification for certification and in-use evaporative test procedures which can be implemented on a case-by-case basis under current EPA regulations. In most cases, prior EPA approval is required. Questions or comments about Enclosure II should be directed to your EPA certification team member.

Sincerely,

A handwritten signature in black ink, reading "Gregory A. Green", is positioned above the typed name.

Gregory A. Green, Director
Certification and Compliance Division
Office of Transportation and Air Quality

Enclosure

ENCLOSURE I

Potential Evaporative Emission Regulation Changes

Enclosure I provides potential evaporative test procedure changes which EPA is considering. Sections of the Code of Federal Regulations (CFR) will need to be amended by rulemaking before the changes listed below may be implemented by EPA or the automobile industry. Comments are welcome, as indicated in the cover letter to this Enclosure.

1) Provide opportunity to waive the 2-day evaporative test for Certification Tests Under Certain Conditions.

In order to reduce certification testing burden, manufacturers have requested rule changes which would allow the 2-day diurnal-plus-hot-soak evaporative emission test to be waived for certification testing, provided the manufacturer demonstrates, using engineering data, engineering judgment, and other means acceptable to EPA, that the canister is adequately purged during the FTP exhaust test. This testing waiver would normally only be available to current technology gasoline-fueled and ethanol-fueled vehicles which use conventional evaporative emission control systems, e.g. vehicles equipped with conventional fuel tank materials, liquid seal ORVR systems, and carbon canister(s). Even though the testing would be waived, vehicles would still be required to meet applicable 2-day emission standards. If EPA selected a vehicle for confirmatory testing, EPA could conduct a 2-day emission test, and the vehicle would be required to demonstrate compliance with the applicable 2-day evaporative emission standard.

EPA is considering possible regulatory modifications to 40 CFR Part 86 that would allow the 2-day evaporative test to be waived for manufacturers' certification tests only. We anticipate that in lieu of providing actual 2-day evaporative test data, manufacturers will be allowed to provide a statement in the application plus some supporting data (to be determined by EPA policy). Regulation changes are expected to require a statement that, "based on the manufacturer's engineering evaluation of appropriate evaporative emission testing, all vehicles in a specific evaporative/refueling family will comply with the applicable 2-day evaporative emission standard." The type of supporting data is yet to be determined, however it must be sufficient to provide EPA with a reasonable technical basis to determine that vehicles will comply with the applicable 2-day emission standard.

2) Allow opportunities for alternative, non-intrusive methods to control fuel tank temperature profile (FTTP) during the running loss portion of the 3-day test.

The provisions of 40 CFR 86.107-98(e)(1) require that test vehicles should be equipped with two temperature sensors installed in the fuel tank to provide an average liquid fuel temperature (which is used to control the fuel tank temperature profile (FTTP) during the running loss drive portion of the 3-day test). Manufacturers have indicated concerns that instrumenting vehicles with thermocouples and fuel tank drains can jeopardize the integrity of the fuel system and,

therefore, the ability of a capable system to demonstrate compliance with lower evaporative emission standards. Such instrumentation also makes it very difficult to perform in-use running loss and 3-day tests on customer-owned vehicles. Manufacturers have requested EPA approval to use alternative, non-intrusive methods of controlling FTTs based on the provisions of 40 CFR 86.106-96(a) states: "Alternate equipment, procedures, and calculation methods may be used if shown to yield equivalent or superior results, and if approved in advance by the Administrator."

EPA is considering possible regulatory modifications to 40 CFR Part 86 that would allow alternative methods of controlling fuel tank temperatures. We believe that alternative methods of controlling FTTs could be made available for current technology gasoline-fueled and ethanol-fueled vehicles which use conventional evaporative emission control systems, e.g. vehicles equipped with conventional fuel tank materials, and carbon canister(s). EPA believes that there are benefits of this proposal, but have several procedural and technical concerns about the use of these alternative methods of controlling the FTT without actually measuring the fuel temperature. We encourage the industry to work together to develop one technically accurate, non-intrusive method of measuring and controlling fuel tank temperatures, which may be used by EPA, ARB and Industry. For resource considerations, we cannot support each manufacturer working independently to develop their own alternative method, or several manufacturers working together to develop multiple variations of one method.

3) Revise the running loss and high-temperature hot soak nominal test temperatures from 95°F to 90°F for high-altitude testing

EPA acknowledges that summertime ambient temperatures tend to be lower in high-altitude regions than at sea-level. Current regulations do not account for this temperature difference in the test procedures, nor for the effects of barometric pressure on fuel volatility.

EPA is considering possible regulatory modifications to high-altitude running loss and high-temperature hot-soak evaporative emissions test procedures to better represent ambient conditions in high-altitude regions. If such changes are appropriate, the regulations could be modified to allow high altitude testing to be performed in a manner which is consistent with the manner in which vehicles are operated in high altitude locations, e.g. in the vicinity of Denver, Colorado; Salt Lake City, Utah; and Albuquerque, New Mexico. Possible changes include adding a 90°F nominal temperature provision for high-altitude testing for hot soak and diurnal testing, e.g., in 40 CFR 86.134-96 paragraphs (d)(3), (f)(1), (f)(2), (g)(1)(xii), (g)(1)(xiv), (g)(2)(ix), (g)(2)(x) and 40 CFR 86.138-96 (e). In addition, the fuel temperature profile determination will need to be adjusted to account for the lower temperature. Regulatory changes may include adding the following language to 40 CFR 86.129-94(d)(7)(iv): "For purposes of high altitude testing, the absolute temperature profile may be determined by adding 90°F (in lieu of adding 95°F) to each point of the relative profile."

4) Clarify IUVP evaporative emissions testing requirements.

EPA is considering possible regulatory modifications to 40 CFR Part 86 that will clarify EPA's position regarding the In-Use Verification Program (IUVP). As discussed in the November 29, 2000 CAP 2000 In-Use Workshop, the running loss emissions test and the 3-day diurnal-plus-hot-soak evaporative emissions test are not required for IUVP testing for gasoline- and flexible-fueled vehicles. The 3-day diurnal-plus-hot-soak test is required for gaseous fueled vehicles, e.g. for CNG and LPG (Propane) vehicles. EPA also noted in the workshop that although the 3-day diurnal and running loss tests are not required for gasoline and flexible-fueled vehicles, in-use vehicles are still required to comply with the 3-day diurnal and running loss emission standards, ref. 40 CFR 86.1811-04(a)(5).

Currently, the provisions of 40 CFR 86.1845-01(c)(5)(ii) require all evaporative tests to be performed, including the 2-day diurnal-plus-hot-soak, the 3-day diurnal-plus hot-soak, the running loss test, and the spitback test. Note that during the rulemaking process, EPA did not anticipate that more than one evaporative test would be required, as outlined in the CAP 2000 Notice of Proposed Rulemaking (NPRM) text at 63 FR 39672, July 23, 1998, which reads as follows:

In addition to the FTP/SFTP exhaust emission testing, EPA proposes that the evaporative/refueling emissions procedure be performed on the basis of the vehicle's evaporative/refueling family, rather than the vehicle's test group. EPA is proposing that a manufacturer perform a single in-use evaporative test and on-board refueling loss test per evaporative/refueling family at both the low and high mileage test points. There are currently ongoing evaporative test streamlining efforts between EPA, California ARB and industry which are separate from today's proposal. EPA intends to adopt the resulting procedure for the in-use evaporative testing once it becomes available. (emphasis added)

ENCLOSURE II

Evaporative Guidance for Certification and In-use Testing

Enclosure II provides EPA guidance and clarification for certification and in-use verification program (IUV) which can be implemented under current EPA regulations. Information about how to implement these evaporative and refueling testing procedures is shown below along with the basis for approval.

1) Clarify IUV evaporative and refueling emissions testing requirements.

- a) Combining certification and IUV test requirements for similar vehicles:
Based on the provisions of 40 CFR 86.1821-01(e), manufacturers may petition EPA prior to certification to combine vehicles into a single evaporative/refueling family which would normally not be eligible to be in a single evaporative/refueling family. As stated in the provisions of 40 CFR 86.1821-01(e), “The petition should provide:
- (1) Substantial evidence that all the vehicles in the larger grouping will have the same degree of evaporative emission deterioration;
 - (2) Evidence of equivalent component durability over the vehicle’s useful life;
and
 - (3) Evidence that the groups will result in sufficient In-Use Verification Program data, appropriate tracking in-use, and clear liability for the Agency’s recall program.”

For example, in the case where two or more evaporative/refueling families are similar except for differences in fuel tank material, the manufacturer may on a case-by-case basis petition EPA to combine these evaporative/refueling families into one evaporative/refueling family. Prior EPA approval is required. EPA would expect to approve such requests provided the manufacturer satisfies the provisions of 40 CFR 86.1821-01(e)(1), (2), and (3). Additionally, the manufacturer should provide assurance that the certification and in-use test vehicles would be expected to yield a worse-case level of evaporative emissions among the vehicles included in the combined families. For example, when combining vehicles with otherwise identical steel and plastic fuel tanks, the test vehicles would be expected to have a plastic fuel tank.

Manufacturers should notify EPA of their intention to combine evaporative/refueling families in the annual preview meeting and also send a written request (with

supporting data, as necessary) to their EPA certification team representative.

b) Combining IUVP Test Requirements for Similar Vehicles:

For cases where manufacturers have not combined vehicles into a single evaporative/refueling family prior to certification as outlined above, manufacturers may petition EPA based on the provisions of 40 CFR 86.106-96(a)¹ on a case-by-case basis to combine IUVP evaporative and refueling testing requirements for several evaporative/refueling families. Prior EPA approval is required. EPA would expect to approve such requests, provided the request is consistent with the provisions of 40 CFR 86.1821-01 (e)(1), (2), and (3); and provided the IUVP test vehicles are clearly expected to yield a worse-case level of evaporative/refueling emissions among the vehicles included in the combined evaporative/refueling families. For example, EPA would expect to approve requests to combine IUVP testing requirements for several evaporative/refueling families where the vehicles in the families used identical evaporative/refueling emission control-related hardware, software, and were otherwise identical except for differences in fuel tank material and fuel tank geometry.

Manufacturers should notify EPA of their intention to combine IUVP evaporative and/or refueling test requirements in the annual preview meeting and also send a written request (with supporting data, as necessary) to their EPA certification team representative.

2) **Clarification of 40 CFR 86. 1811-04(e)(6); sometimes allowing California test fuel and evaporative test procedures to be used in lieu of Federal test fuel and evaporative test procedures.**

The provisions of 40 CFR 86. 1811-04(e)(6) read as follows:

"In cases where applicable California emission standards are as stringent or more stringent than applicable standards specified under this paragraph (e), the Administrator may accept data indicating compliance with California standards to demonstrate compliance for certification purposes with the standards required under this paragraph (e). The Administrator may require manufacturers to provide comparative test data to show that a vehicle meeting California standards under California test conditions and procedures will also meet the standards under this paragraph (e) when tested under test conditions and procedures in the Part 86."

Based on the above provisions and the provisions of 40 CFR 86.106-96(a), EPA intends to

¹The provisions of 40 CFR Part 86 Subpart B, including 40 CFR 86.106-96(a), contain test procedures applicable for IUVP testing.

accept certification, and IUVP test data from running loss and diurnal-plus-hot-soak (2-day and 3-day) emissions tests when conducted using California test conditions and procedures to demonstrate compliance with applicable Federal standards (provided the applicable California standards are equal to or more stringent than the applicable Federal standards).

Manufacturers should notify EPA of their intention to use California test data to demonstrate compliance with applicable Federal evaporative emission standards in the annual preview meeting and also send a written request with supporting data to their EPA certification team representative. Supporting data should include on a case-by-case basis, a minimal showing of "comparative test data" per 40 CFR 86.1811-04(e)(6) which clearly demonstrates that the test vehicle(s) will comply with the applicable Federal Tier 2 evaporative standards if tested using California test conditions and procedures. With prior EPA approval, California test data may be submitted in lieu of Federal test data for 50-state evaporative/refueling families and for "carry across" data from a California evaporative/refueling family to a Federal family. This provision is expected to be used for 50-state evaporative/refueling families, where all vehicles in the family are designed to meet Federal Tier 2 evaporative standards and either California LEV-II near zero or zero evaporative emission standards. This provision is not expected to be used for refueling tests, because California requires the refueling test to be performed using Federal test fuel.

3) Clarification of refueling test procedure for gasoline- and flexible-fueled vehicles

Based on the provisions of 40 CFR 86.106-96(a) manufacturers may petition EPA on a case-by-case basis for approval of the use of two optional variations to be used in combination with the current refueling test procedure. These variations will reduce the burden and time required to perform certification and IUVP refueling tests.

a) Currently, the provisions of 40 CFR 86.153-98(a) require vehicle preconditioning for the refueling test in accordance with the 2-day test preconditioning procedures. However, manufacturers have requested that EPA approve a streamlined refueling test path for vehicles that are in the process of being tested for exhaust and/or evaporative emissions (and the vehicle has remained under laboratory ambient temperature conditions). For these vehicles, EPA generally expects to allow on a case-by-case basis the refueling test to be performed immediately after a diurnal emissions test (which was conducted using EPA test procedures and EPA (Indolene) test fuel per 40 CFR 86.133) or after another refueling emissions test (per 40 CFR 86.154); provided the canister has not been purged since the last emissions test and the vehicle has remained under laboratory ambient temperature conditions. If approved in advance by EPA, the manufacturer may omit the preconditioning steps outlined in 40 CFR 86.132-96 (a) through (g) and begin with paragraph (h) preloading of the evaporative canister(s). This variation in the test procedure is expected to reduce the testing time by approximately one day, without changing the stringency of the refueling test procedure.

Manufacturers should notify EPA of their intention to use such an alternate refueling test sequence in the annual preview meeting and also send a written request with supporting data to their EPA certification team representative. Supporting data should include comparative back-to-back tests which demonstrates with confidence that the alternate test sequence is equivalent to (or a more severe test condition) than the normal refueling test procedure.

b) Currently, the provisions of 40 CFR 86.152-98(b) and 40 CFR 86.153-98 (d) and (e)(2) require the canister to be disconnected when initially filling the fuel tank to the 95 percent of nominal tank capacity (in the preconditioning portion of the ORVR test for non-integrated systems) and also for integrated and non-integrated systems when draining and refueling the fuel tank to the 10 percent level (just prior to the 6-24 hour soak, which precedes the actual refueling and measurement portion of the refueling test). Manufacturers have expressed concern that the intrusive nature of this testing could be difficult to perform on some vehicles and also lead to variability in the test data. Therefore, EPA generally expects to allow on a case-by-case basis, approval of alternate, non-intrusive methods of performing the drain and fill portions of the ORVR test. Manufacturers would be expected to provide assurance that the alternate method of performing these drain and fill preconditioning steps is equal to or more severe than the methods outlined in the regulations. For example, EPA expects some manufacturers to request that the canisters not be disconnected when performing these preconditioning drain and fill portions of the refueling test—a request which EPA would generally expect to approve provided the manufacturer provided engineering data indicating that this condition would result in a more severe test condition. Even though current regulations allow EPA approval of alternate methods, EPA may, in a future regulation make the following regulation changes:

40 CFR 86.152-98(b) may be revised to read, "Optionally, provide valving or other means to allow the venting of the refueling vapor line to the atmosphere rather than to the refueling emissions canister(s) when allowed by this test procedure."

In 40 CFR 86.153-98 (d) and (e)(2), the phrase "canister(s) shall be disconnected" may be replaced with the phrase "canister(s) may be disconnected."

Manufacturers should notify EPA of their intention to use such an alternate refueling test sequence in the annual preview meeting and also send a written request with supporting data to their EPA certification team representative. Supporting data should include comparative back-to-back tests which demonstrates with confidence that the alternate test procedure is equivalent to (or a more severe test condition) than the normal refueling test procedure.

4) Provide the option to use alternative canister loading methods

Based on the provisions of 40 CFR 86.106-96(a) manufacturers may petition EPA on a case-by-case basis to approve the use of alternative methods to preload the canister(s) during the exhaust and evaporative test sequence. EPA has previously approved such requests from several manufacturers. These alternate methods of performing canister preloading are needed to perform in-use testing because for some vehicles, the canister is inaccessible and cannot easily be removed from the vehicle. Additionally, manufacturers indicate that the use of a less intrusive canister preloading method decreases the test burden and increases the confidence in the test data (without jeopardizing the integrity of the evaporative emission control system). EPA has approved the following hierarchy of canister preconditioning methods, such that any more stringent method may be used in lieu of a required or specified method. The following methods (listed in hierarchy from most stringent to least stringent²) may be used by manufacturers for certification and IUVF tests:

1. 300-bed-volume purge followed by a 1.5-times working capacity butane/nitrogen load (at 15g butane/hour), as specified in 40 CFR 86.132-96(h)(1)(iii)
2. 300-bed-volume purge followed by a 1.0-times working capacity butane/nitrogen load (at 15g butane/hour), as specified in 40 CFR 86.132-96(h)(1)(iii), replacing “1.5 times” with “1.0 times” the working capacity.
3. Load to 2-gram breakthrough via butane loading (at 40g butane/hour) or via repeated diurnal heat builds, as specified in 40 CFR 86.132-96(j)(1) and (2)
4. 1-hour heat build, as specified in 40 CFR 86.133-90.

For example, with prior EPA approval, whenever the 2-gram breakthrough preconditioning is required (such as for the refueling emissions test, the supplemental two-diurnal test, and some exhaust emissions tests), any of the two, more stringent methods may be used for canister preconditioning, as a substitute. However, the less-stringent 1-hour heat build could not be used as a substitute.

Based on information received from several manufacturers, justification for the hierarchy of methods is as follows:

1. The 1-hour heat build does not saturate the canister. The other preconditioning methods saturate the canister.

²The term "more stringent" refers to a canister loading method which, in general, results in a higher quantity of hydrocarbon loading. Depending on the condition of the canister when the vehicle enters the test sequence, a "more stringent" canister loading method might not always result in a more stringently loaded canister (because the 2-gram breakthrough method of canister loading does not purge the canister prior to canister loading and because gasoline vapors are more difficult to purge than butane vapors during the FTP test).

2. A 300-bed-volume purge followed by a 1.0-times working capacity butane/nitrogen load (at 15g butane/hour) has been generally demonstrated to load more hydrocarbons into the canister than the 2-gram breakthrough method (at 40g butane/hour). The slower load rate results in lower canister bed temperatures, increasing the capacity of the canister to adsorb more introduced butane.
3. A 300-bed-volume purge followed by a 1.5-times working capacity butane/nitrogen load (at 15g butane/hour) loads more butane into the canister than a 300-bed-volume purge followed by a 1.0-times working capacity butane/nitrogen load (at 15g butane/hour).

Manufacturers should notify EPA of their intention to use such alternate canister loading methods in the annual preview meeting and also send a written request with any available supporting data to their EPA certification team representative. Manufacturers should also be prepared to discuss in the annual certification preview meeting the safety of the different canister loading methods, especially related to the possibility of preloading canisters on test vehicle with mislabeled canister hoses, improperly connected canister purge/ loading/vent hoses, pinched hoses, cut or leaky hoses, etc. EPA is especially interested in the location of the canister vent hose on vehicles throughout the manufacturer's product line, and whether the canister vent line will be routed to a dummy canister during manufacturer's testing or allowed to vent to atmosphere.

5. Eliminate minimum injection requirements for shed calibrations, and provide manufacturers opportunities to propose alternative acceptability criteria and techniques for retention checks.

Manufacturers have requested that EPA allow manufacturers to perform evaporative shed retention checks using California's procedure (which calibrates the shed to Tier 2 and LEV-II emission levels instead of Federal Tier 1 levels). For example, Federal requirements specified in 40 CFR 86.117-96(c)(1)(vii) include the injection of 2 to 6 grams of methanol and/or propane with a 5-minute minimum mixing time for enclosure retention checks. California requires an equivalent amount of methanol and/or propane injection for current evaporative standards, but with a 5-minute maximum mixing time, and has revised the injection amounts to between 0.5 to 1.0 grams of methanol and/or propane for new (LEV2/PZEV) evaporative standards.

The provisions of 40 CFR 86.117-96 state that "Alternate calibration methods may be used if shown to yield equivalent or superior results, and if approved in advance by the Administrator." Based on these provisions, and to eliminate the need to perform two retention checks on each shed, EPA will approve on a case-by-case basis the use of alternate methanol/propane injection methods, including the use of the California procedure. Manufacturers' requests to use alternate methods should be submitted in writing to their certification team member and include the acceptability criteria, and a technical description of other differences from the calibration method specified in 40 CFR 86.117-96.